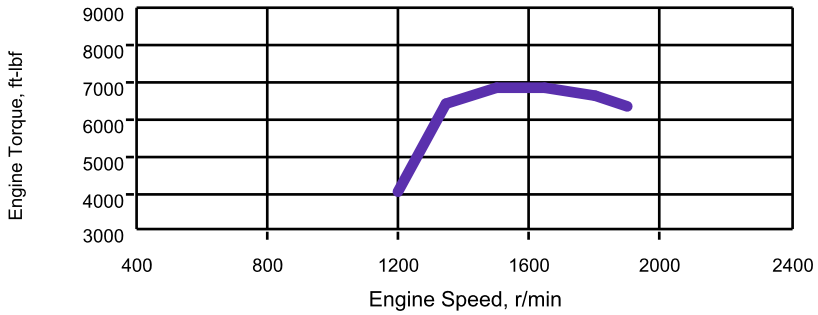
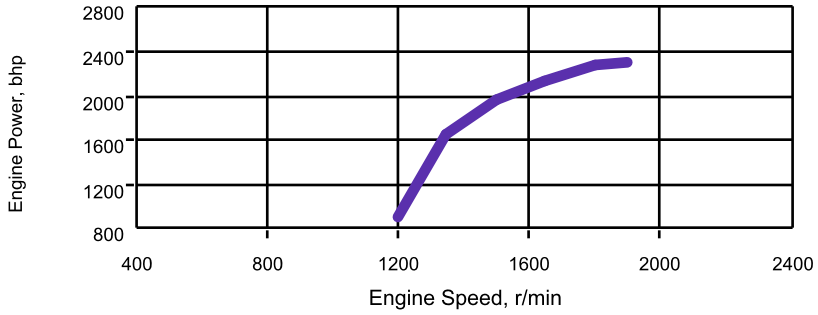
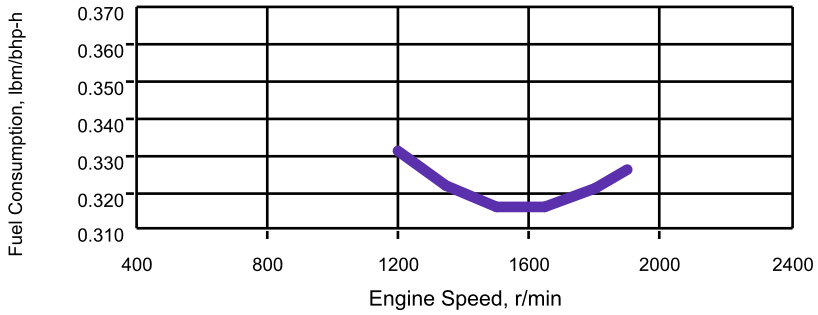
Surface Mining
16V4000 - T1637K33
2300 bhp @ 1900 r/min

Performance Data
06N04M1477







Available power is shown. Data does not include parasitic losses from fans, accessories, etc. Parasitic losses will vary depending on the final product configuration and reduce the available power accordingly.

Performance Data			
Engine Speed, r/min	Engine Power, bhp	Engine Torque, ft-lbf	Fuel Consumption, lbm/bhp-h
600	-	-	-
750	-	-	-
900	-	-	-
1050	-	-	-
1200	917	4013	0.331
1350	1645	6400	0.322
1500	1962	6869	0.316
1650	2147	6834	0.316
1800	2280	6653	0.321
1900	2300	6358	0.326
1950	-	-	-
2000	-	-	-

Tolerance for power values shown is +5/-5% at the conditions listed.
Tolerance for fuel values shown has not been specified.

Condition	ISO 3046
Air Inlet Temp.	77 °F
Relative Humidity	30 %
Total Baro. Pressure	30 in. Hg
Fuel Inlet Temp.	77 °F
Spec. Fuel Gravity	0.8472
[ref. temp.]	77 °F
Air Inlet Restriction	10 in. H_2O
Exhaust Back Pressure	15 in. H_2O
Raw Water Temp.	- °F
Min. Fuel Heat Content	20,500 Btu/lb_m
[ref. test spec]	-
Air Density	0.1 lb/ft^3
Fuel Density	7.07 lb/gal (US)
Oil Density	7.50 lb/gal (US)

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Calibration Details	
Control System	DDEC IV Electronics
Maximum Power	2300 bhp
Maximum Power Speed	1900 r/min
Rated Power Limit	2300 bhp
Rated Power Limit Speed	1900 r/min
Peak Torque	6869 ft-lbf
Peak Torque Speed	1500 r/min
Typical Low Idle Speed	600 r/min
Typical High Idle Speed	2000 r/min
Intended Use	multiple markets & applications

Cooling System	
Coolant Capacity in Engine Circuit	173 qt (US)
Coolant Capacity in Charge Air Circuit	44 qt (US)
Total Coolant Capacity	218 qt (US)
Coolant Flow Rate in Engine Circuit	465 gal/min (US)
@ Peak Torque Speed (1500 r/min)	369 gal/min (US)
Coolant Flow Rate in Charge Air Circuit	180 gal/min (US)
@ Peak Torque Speed (1500 r/min)	143 gal/min (US)
Heat Rejection to Engine Coolant Circuit (Intercooler Inlet Temperature < 135 °F)	32,550 Btu/min
Heat Rejection to Engine Coolant Circuit (Intercooler Inlet Temperature > 135 °F)	32,750 Btu/min
Heat Rejection to Charge Air Coolant Circuit (Intercooler Inlet Temperature < 135 °F)	27,700 Btu/min
Heat Rejection to Charge Air Coolant Circuit (Intercooler Inlet Temperature > 135 °F)	26,350 Btu/min
Radiated Heat Rejection	3450 Btu/min
@ Peak Torque Speed (1500 r/min)	- Btu/min

All values are at rated engine speed and power at ISO 3046 conditions, unless otherwise specified.

Available power is shown. Data does not include parasitic losses from fans, accessories, etc. Parasitic losses will vary depending on the final product configuration and reduce the available power accordingly.

Exhaust System	
Exhaust Flow Rate (volumetric)	222.5 ft³/s
@ Peak Torque Speed (1500 r/min)	- ft³/s
Exhaust Temperature	711 °F
@ Peak Torque Speed (1500 r/min)	- °F

Fuel System	
Injector Device	-
Injection System	Common Rail
Fuel Flow Rate (mass)	1663.5 lbm/h
Fuel Flow Rate (volumetric)	235.3 gal/h (US)
Fuel Spill Rate (mass)	913.7 lbm/h
Fuel Spill Rate (volumetric)	129.2 gal/h (US)
Fuel Consumption (mass)	749.8 lbm/h
Fuel Consumption (volumetric)	106.1 gal/h (US)
Heat Rejection to Fuel	310 Btu/min

Intake System	
Engine Air Flow Rate (volumetric)	103.5 ft³/s
@ Peak Torque Speed (1500 r/min)	- ft³/s
Intake Manifold Pressure	62 in. Hg
Turbocharger Compressor Inlet Temp.	- °F

Lubrication System	
Oil Flow Rate	124 gal/min (US)
@ Peak Torque Speed (1500 r/min)	- gal/min (US)
Oil Pressure	88 lbf/in.²
@ Typ. Low Idle Speed (600 r/min)	50 lbf/in.²
Oil Consumption (mass)	3.75 lbm/h
Oil Consumption (volumetric)	2.00 qt/h (US)

Additional Information	
Altitude Capability	12,000 ft
Brake Mean Effective Pressure (BMEP)	242 lbf/in.²
Compression Ratio	13.7 : 1
Friction Horsepower	260.2 fhp
@ Peak Torque Speed (1500 r/min)	170.3 fhp
Mean Piston Speed	2369 ft/min
Torque Available at 800 r/min (T_{800})	2952 ft-lbf
Turbocharger	GTA5523 (1.12 A/R)

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Cooling System		
Min. Coolant Flow Rate in CAC Circuit	171.1	gal/min (US)
@ Peak Torque Speed (1500 r/min)	135.9	gal/min (US)
Min. Coolant Flow Rate in Engine Circuit	441.7	gal/min (US)
@ Peak Torque Speed (1500 r/min)	350.5	gal/min (US)
Max. Coolant Out Temp. in Engine Circuit	203	°F
Max. CAC Water Pump Discharge Pressure (Exclusive of Pressure Cap)	-	$lb_f/in.^2$
Max. Engine Water Pump Discharge Pressure (Exclusive of Pressure Cap)	-	$lb_f/in.^2$
Min. Water Pump Inlet Pressure (Rapid Warm-up Rad.)	0.0	$lb_f/in.^2$
Max. Water Pump Static Pressure Head	21.6	$lb_f/in.^2$
Max. External Restriction in CAC Circuit	-	$lb_f/in.^2$
Max. External Restriction in Engine Circuit	-	$lb_f/in.^2$
Max. Intercooler Coolant Outlet Temp.	174	°F
Max. Ambient-to-Intercooler Coolant Inlet Temp. Rise	31	°F
Min. Engine Coolant Fill Rate	5.0	gal/min (US)
Min. Drawdown	8	%
Max. Dearation Time	30	min
Min. Pressure Cap	14.1	$lb_f/in.^2$
Max. System Pressure (Exclusive of Pressure Cap)	-	$lb_f/in.^2$
Min. Top Tank Coolant Temp.	160	°F

Crankshaft System		
Max. Radial Load- Crankshaft	-	lb_f
Max. Continuous Load- Thrust Bearing	1595	lb_f
Max. Intermittent Load- Thrust Bearing	3980	lb_f
Max. Shock Load- Thrust Bearing	-	lb_f
Max. Vertical Load at Rear Face of Flywheel (†)	2248	lb_f
Max. Static Bending Moment at Rear Face of Block	1000	$ft\text{-}lb_f$

(†) The weight of the flywheel must be included with the OEM components.

Electrical System		
Max. Resistance of Starting Circuit - 24 V System	0.002	Ω
Rec. Battery Capacity - 24 V System	2500	CCA

Exhaust System		
Max. Exhaust System Back Pressure	1.5	in. Hg
Rec. Dry Exhaust Pipe Dia. - Single	14.2	in.
Rec. Dry Exhaust Pipe Dia. - Dual	9.8	in.

Fuel System		
Max. Fuel Inlet Temp.	140	°F
Max. Fuel Pump Suction for Clean System	6.0	in. Hg
Max. Fuel Pump Suction for Dirty System	12.2	in. Hg
Max. Fuel Return Pressure	7.3	$lb_f/in.^2$
Rec. Primary Fuel Filter Size	30	micron
Max. Secondary Fuel Filter Size	8	micron

Intake System		
Max. Ambient to Turbo Compressor Inlet Temp. Rise	31	°F
Max. Crankcase Pressure	10	in. H_2O
Max. Intake Restriction for a Clean Air Cleaner	12	in. H_2O
Max. Intake Restriction for a Dirty Air Cleaner	20	in. H_2O
Rec. Intake Pipe Dia. - Single	12.0	in.
Rec. Intake Pipe Dia. - Dual	8.0	in.

Lubrication System		
Max. Change in Oil Pressure from Engine Out to Oil Cooler Inlet for Remote-mounted Filters	-	in. H_2O

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Certification Summary	
Certification Code (CWC)	5338
US Nonroad (Tier 1)	Certified.
US Nonroad (Tier 2)	Not certified.
US Nonroad (Tier 3)	Not certified.
US Nonroad (Tier 4)	Not certified.
EURO Nonroad (Stage I)	Not certified.
EURO Nonroad (Stage II)	Not certified.
EURO Nonroad (Stage III)	Not certified.
EURO Nonroad (Stage IV)	Not certified.
Compliance Summary	
Japanese Nonroad	No.

Available power is shown. Data does not include parasitic losses from fans, accessories, etc. Parasitic losses will vary depending on the final product configuration and reduce the available power accordingly.

Emission Data		
Steady-state Emission Summary		
NO_x	14,015	g/h
CO	751	g/h
HC	914	g/h
SO_2 - with .5% sulfur content fuel	1700	g/h
SO_2 - with .05% sulfur content fuel	170	g/h
Particulates	189	g/h
C1 Cycle Emission Summary		
NO_x	6.2	g/bhp·h
CO	0.900	g/bhp·h
HC	0.540	g/bhp·h
Particulates	0.120	g/bhp·h
Opacity Mode		
Acceleration	-	%
Lug	-	%
Peak	-	%
Smoke		
Bosch No.	-	
@ Peak Torque Speed (1500 r/min)	-	

Emission levels of the engine may vary as a function of ambient temperature, barometric pressure, humidity, fuel type and quality, installation parameters, measuring instrumentation, etc. The data provided are laboratory results from one engine representing this rating. The data was obtained under controlled environmental conditions with calibrated instrumentation traceable to the United States National Bureau of Standards and in compliance with US EPA regulations found at 40 CFR Part 89 (Control of Emissions From New and In-Use Nonroad Compression-Ignition Engines). The weighted cycle value from each engine is guaranteed to be below the US EPA Standards at the US EPA defined conditions.

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Frequency, Hz	Surface, dB(A)	Exhaust, dB(A)	Structureborne Longitudinal, dB(A)	Structureborne Transverse, dB(A)	Structureborne Vertical, dB(A)
40	-	-	-	-	-
80	-	-	-	-	-
100	-	-	-	-	-
125	-	-	-	-	-
160	-	-	-	-	-
200	-	-	-	-	-
250	-	-	-	-	-
315	-	-	-	-	-
400	-	-	-	-	-
500	-	-	-	-	-
630	-	-	-	-	-
800	-	-	-	-	-
1000	-	-	-	-	-
1250	-	-	-	-	-
1600	-	-	-	-	-
2000	-	-	-	-	-
2500	-	-	-	-	-
3150	-	-	-	-	-
4000	-	-	-	-	-
5000	-	-	-	-	-
6300	-	-	-	-	-
8000	-	-	-	-	-
10,000	-	-	-	-	-
12,500	-	-	-	-	-
16,000	-	-	-	-	-
20,000	-	-	-	-	-
Total	107.4	-	-	-	-

Conditions and Tolerances					
Data Tolerance	Tolerance for values shown is +1/-0 dB(A) at the conditions listed.	Tolerance for values shown is +1/-0 dB(A) at the conditions listed.	Tolerance for values shown has not been specified.	Tolerance for values shown has not been specified.	Tolerance for values shown has not been specified.
Test Standard	SAE J2101	not specified	not specified	not specified	not specified
Comments	Data is representative of a single unit.	not specified	not specified	not specified	not specified

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Camshaft	
UPC Group Number	-
Type	Gear-driven
Location	In the cylinder block
Material	Steel alloy
Surface Finish - Journal	Ground finish
Surface Finish - Lobe	Ground finish

Camshaft Bearing	
Type	One-piece design
Material	Leaded bronze - Shrink fitted
Mean Effective Length [MEL]	1.063 in.
Mean Journal Diameter [MJD]	3.622 in.
Projected Area [per bearing]	3.85 in.²

Connecting Rod	
Type	Rectangular cross-section
Material	Forged, steel

Connecting Rod Cap	
Type	Angled split-cap design
Material	Forged, steel alloy

Connecting Rod Crank Pin Bearing	
Type	Split-shell design
Quantity [per journal]	2
Material - Lower Bearing	Sputtered aluminum and tin overlay
Material - Upper Bearing	Rillenlager, aluminum and tin overlay
Mean Effective Length [MEL]	1.614 in.
Mean Journal Diameter [MJD]	4.610 in.
Projected Area [per bearing]	7.44 in.²

Crankshaft	
Type	One-piece
Material	Forged Steel
Surface Finish - Journal	Induction hardened with ground finish
Type of Balance	Dynamic with machined bolt on counter-weight

Crankshaft Main Bearing	
Type	Split-shell design
Quantity [per journal]	2
Material - Lower Bearing	Sputtered aluminum and tin overlay
Material - Upper Bearing	Rillenlager, aluminum and tin overlay
Mean Effective Length [MEL]	1.811 in.
Mean Journal Diameter [MJD]	6.304 in.
Projected Area [per bearing]	11.42 in.²

Crankshaft Thrust Bearing	
Type	Flange-type design
Quantity	2
Mean Effective Length [MEL]	2.402 in.
Mean Journal Diameter [MJD]	6.299 in.
Projected Area [per bearing]	15.13 in.²

Cylinder Block	
UPC Group Number	06A01 2081
Type	90-degree vee cylinder block
Material	Gray cast iron

Cylinder Head	
UPC Group Number	06A02 0733
Type	1 cylinder head per cylinder
Material	Gray cast iron
Air Management	Cross-flow

Cylinder Liner	
UPC Group Number	06A01 2081
Type	Wet, replaceable liner
Material	Centrifugally cast, high alloy cast iron

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Exhaust Valve	
Type	Poppet valve
Material - Head	Nimonic 80A
Material - Stem	Nimonic 80A
Operating Mechanism	Push rod with rocker arm
Type of Lifter	Roller follower, swing armed
Quantity [valves per cylinder]	2
Quantity [springs per valve]	2

Exhaust Valve Insert	
Type	Integral to cylinder head
Material	Gray cast iron

Intake Valve	
Type	Poppet valve
Material - Head	Steel
Material - Stem	Steel
Operating Mechanism	Push rod with rocker arm
Type of Lifter	Roller follower, swing armed
Quantity [valves per cylinder]	2
Quantity [springs per valve]	2

Intake Valve Insert	
Type	Integral to cylinder head
Material	Gray cast iron

Piston	
Type	Two-piece design
Material - Crown	Forged steel
Material - Skirt	Steel alloy
Cooling	Oil- spray

Piston Pin	
Type	Full floating pin design
Material	Steel
Wrist Pin Keepers	Snap ring design

Piston Pin Bearing	
Type	One-piece bushing
Material	Bronze - leaded

Piston Ring, Compression	
Top Ring	Rectangular design
Second Ring	Rectangular, tapered face design
Quantity [per piston]	2

Piston Ring, Oil	
Type	Two-piece, spring-loaded
Quantity [per piston]	1
Location	Below compression ring

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Description	
Model Number	T1637K33
Number of Cylinders	16
Bore	6.50 in.
Stroke	7.48 in.
Displacement - per cylinder	248 in.³
Displacement - total	3967 in.³
Aftertreatment	No Aftertreatment Device
Aspiration	Turbocharged
Combustion System	Direct Injection
Charge Air Cooling System	Separate Circuit Charge Cooling (SCCC)
Electronic System	DDEC IV Electronics
Engine Type	90-degree Vee Engine
Ventilation	Open Engine Crankcase
Status	Available
Availability Date	24 SEP 1999
Discontinued Date	-

This model is approved for numerous nonroad & stationary applications.

Size	
Overall Length	118.41 in.
Overall Width	62.51 in.
Overall Height	68.36 in.

Weight	
Approximate Dry Weight	15,615 lbm
Approximate Wet Weight	16,599 lbm

Center of Gravity for a Dry Engine	
Distance from Rear Face of Block: x-axis	44.10 in.
Distance above Crankshaft: y-axis	9.30 in.
Distance to the Right of the Crankshaft: z-axis	0.00 in.

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